



OFFICE MEMORANDUM

DATE: May 1, 2001

TO: Region Engineers
Region Associate Delivery Engineers
Region Construction Engineers
Resident/Project Engineers/TSC Managers
Region Traffic Engineers

FROM: C. Thomas Maki
Chief Operations Officer

Gary D. Taylor
Chief Engineer/Deputy Director
Bureau of Highway Technical Services

SUBJECT: Bureau of Highway Instruction Memorandum 2001-07
Field Verification of Bituminous Mix Design - Continuation of Pilot Study for 2001
Construction Season

The purpose of this memorandum is to notify department staff and contractors of the current procedure for the field verification of bituminous mix design (test strip) available for the 2001 construction season. The attached procedure for the Field Verification of Mix Design has been modified by the MDOT/MAPA Mix Design Procedures Committee.

This is a continuation pilot study and is voluntary for contractors for the 2001 construction season, with the approval of the project engineer. The procedure is applicable to all mixture types used on MDOT projects. The contractor and project engineer will discuss the possibility of using the test strip option at the pre-construction meeting to allow for adequate decision making and planning. Whenever the procedure is approved, it should be properly authorized through a contract modification.

The following are potential benefits of this new procedure.

- Verification of plant produced mixture (more representative) versus laboratory produced mixture.
- Minimizes initial job mix formula changes during production.

The test strip should be located on the project site and will be paid at the contract unit price for the bituminous mixture used. If an offsite location is approved by the project engineer, the cost of the test strip material and paving operation will be at the contractor's expense. Upon completion of the test strip, all paving shall be suspended until all verification testing is completed by MDOT. Material used on the project for Field Verification and accepted for mix design is subject to all QC/QA, density, and other related contract requirements. If used on the project, the tonnage of field verified mixture will be included in the lot average of the first lot of material for evaluation, along with the three QA subplot samples. Unacceptable material shall be removed from the project at the contractor's expense.

At their option contractors can still submit samples to the Construction and Technology Division for mix design verification, as outlined in the *Procedures Manual for Submitted, Express, and Superpave Mix Design Processing*.

If you have any questions or comments regarding this information, feel free to contact Mike Frankhouse at 517-322-5672, Gary Mayes at 517-322-5668, or Scott Greene at 517-322-1184.

Chief Operations Officer

Chief Engineer/Deputy Director
Bureau of Highway Technical Services

BOHTS:C/T:MF:kab

Subject Index: Bituminous

Attachment

cc: C & T Staff
Real Estate, M. Frierson
Design Division, P. Miller
Maintenance Division, C. Roberts
Traffic & Safety, J. O'Doherty
C & T Division, J. Culp
OEO - S. El Ahmad
J. Klee
R. Knapp
V. Blaxton
B. Jay
K. Trentham
MRBA
MAPA
MCPA
MCA
MAA
AUC
CRAM
MRPA
ACEC

FIELD VERIFICATION OF BITUMINOUS MIX DESIGN

Description

This procedure provides engineers in the regions with guidelines for using the option of test strips for field verification of mix designs. If approved by the PE, contractors and MDOT region personnel will gain experience with this method of mix design verification.

The procedure includes a paper review of mix designs with reduced central lab sample submission, leaving verification of mix designs to take place in the field by a qualified MDOT regional technician.

The contractor will still be allowed to submit a mix design following the existing procedure outlined in the Procedures Manual for Mix Design Processing.

Test Strip Production

Requirements

- Approval by the PE of the test strip at the **Pre-Construction** meeting.
- A central laboratory paper reviewed mix design consistent with the requirements within this document.
- Notification of intent to pave test strip must be sent to the project engineer and the TMI in writing within five working days prior to the paving of the test strip.
- The test strip will consist of 200-300 tons of plant produced mixture from the facility that is providing mixture for the project.
- The location and tonnage of the test strip must be approved by the project engineer. The preferred location for the test strip will be on the project. If an offsite location is approved by the project engineer, then the cost of the test strip will be the responsibility of the contractor.
- The width and construction methods of the test strip shall be representative of the project paving operation.
- Samples for the field verification **will be taken by MDOT personnel** in accordance with MTM 324 Michigan Test Method for Sampling Bituminous Paving Mixtures from Behind Lay Down Machine.
- The contractor shall obtain belt samples of the combined aggregate blend, which includes both the virgin aggregate and the RAP (if applicable), using a method approved and witnessed by an MDOT representative.

- MDOT **will have three days** from the completion of sampling to perform all field mixture verification and density testing of the test strip. The Contractor will delay production paving until the mix design is approved.
- All field verified material placed within the project limits will fall under the QC/QA special provision for that project **if accepted**. Accepted material will be included with the tonnage in the first lot of the project. Material placed on the project and rejected by the field verification shall be removed at the contractors expense. Verified mix design material will not be excluded from the contract documents for acceptance and payment.
- Only two test strips will be allowed per mix design. If the contractor has not given at least 24 hours notice of the cancellation to perform the test strip on the day agreed to by the project engineer and the traveling mix inspector, then that will count as one of the test strips for that mix design.

Mixture adjustments, supported by trial runs and test data, will be allowed prior to paving of the test strip. ***No adjustments to the JMF will be made to the plant during the production of mixture for the test strip.***

Submitted mix designs reviewed by MDOT ***will not*** be considered verified until the field verification process is complete.

Tolerance Limits for MDOT Field Verification of Superpave Mix Designs

1. Field Verified

- Theoretical Maximum Specific Gravity ± 0.019
- Air Voids $\pm 1.00\%$ @ N design
- Compacted Specimen Height $115\text{mm} \pm 3\text{mm}$.
- VFA must meet specification requirements.
- VMA must be $\pm 1.2\%$ of target value and above the minimum value for the mixture type.
- Soft Particle must meet minimum specification. It will be picked when flagged by the paper review.
- % Crushed and Angularity Index, from the belt samples of the combined aggregate blend, or recovered combined aggregate sample from the ignition furnace must meet specification requirements.
- Asphalt content by an approved method $\pm 0.3\%$.

- Aggregate gradation must be within the control points, outside of the restricted zone or meet contract requirements, and plotted on a 0.45 power chart. The fines to effective asphalt ratio of the mixture must be maintained within the range of the mixture specification.

2. Informational Tests

- There shall be a minimum of four cores taken in the test strip with an MDOT representative present at the time of coring. A minimum of 75% of cores from the test strip shall be equal to or greater than 92% of Theoretical Maximum Density. MDOT will choose the random locations of each core within the test strip. The segment for coring shall be no less than 25 feet in length.
- Belt samples of the combined aggregate blend, obtained by the contractor and witnessed by an MDOT representative during the test strip production, will be submitted to Lansing C&T for fine, coarse and #8 bulk gravity testing.

Superpave Test Strip Paper Review Requirements

MDOT Central Laboratory will have a minimum of four days for design review and mixture testing prior to paving of the test strip. Mix Designs submitted to the central lab shall meet all mixture specifications. Samples submitted to the Central Lab shall be in accordance with the procedures manual except as noted below.

Note: All Mixture Samples are submitted at Optimum Asphalt Content.

Note: This is only for the full field verification option.

Note: Mix Designs will be reviewed according to the tolerances that are located on page 26 of the Procedures Manual for Mix Design Processing.

1. Materials Required

- 1 - 2300 Gram sample of mixture. For Theoretical Maximum specific Gravity.
- 2 - (*) Gram samples of mixture. For Compacted Bulk Specific Gravity.
- 1 - (5000) Gram Sample of combined aggregate blend.

Aggregate Wear Index (AWI) samples shall be submitted to the central lab at least one week prior to mix design submittal. This may delay the test strip verification if not submitted in a timely manner.

* The weight of the mix to compact to 115 mm height.

2. Documentation Required

Note: Computer duplication of forms must follow MDOT formats.

- Form 1855 - Superpave Bituminous Mix Design Communication.
- Form 1923 - Sample Identification. Note: must be included in each sample package.
- Form 1858 - Superpave Mix Design Summary Sheet.

- Form 1806 - Theoretical Maximum Specific Gravity Worksheet.
- Form 1851 - Gyratory Compacted Bulk Specific Gravity Worksheet.
- Form 1862 - Superpave Mix Design Checklist.
- Provide documentation of Quality Control Testing of RAP Stockpiles. This includes a minimum of 3 Theoretical Maximum Specific Gravities performed on stockpile. Note: only if RAP is included in the mixture.
- Combined gradation plotted on the 0.45 power gradation chart.
- Mix Design Regression Analysis.
- Complete Superpave Worksheet from gyratory.
- Full set of height data.
- TSR Worksheet
- For consultants, a letter from the contractor authorizing that you, the consultant, acts as the contractors agent bon mix design issues for the project.

Tolerance Limits for MDOT Field Verification of Marshall Mix Designs

1. Verified

- Theoretical Maximum Specific Gravity ± 0.019 from target.
- Air Voids ± 1.00 % of target.
- Compacted Specimen volume $515\text{cm}^3 \pm 8\text{cm}^3$.
- VMA must be $\pm 1.2\%$ of target value and above the minimum value for the mixture type.
- Soft Particle must meet minimum specification. It will be picked when flagged by the paper review.
- % Crushed samples and Angularity Index, from belt samples of the combined aggregate blend, or recovered combined aggregate sample from the ignition furnace must meet minimum specification.
- Asphalt content by an approved method. $\pm 0.3\%$
- Aggregate gradation within design master gradation and be plotted on a 0.45 power chart. Fines to Asphalt Ratio, or Sand Ratio must be maintained per mixture requirements.

2. Informational Tests

- There shall be a minimum of four cores taken in the test strip with an MDOT representative present at the time of coring. A minimum of 75 % of cores from the Test Strip shall be equal to or greater than 92% of Theoretical Maximum Density. MDOT will choose the random locations of each core within the test strip. The segment for coring shall be no less than 25 feet in length.

- Belt samples of the combined aggregate blend, obtained by the contractor and witnessed by an MDOT representative during the test strip production, will be submitted to Lansing C&T for fine, coarse and #8 bulk gravity testing.

Marshall Test Strip Paper Review Requirements

MDOT Central Laboratory will have a minimum of four days for design review and mixture testing prior to paving of the test strip. Mix Designs submitted to the Central Lab shall meet all mixture specifications. Samples submitted to the Central Lab shall be in accordance with the procedures manual except as noted below.

Note: All Mixture Samples to be submitted at Optimum Asphalt Content or at a point closest to Optimum Asphalt Content .

Note: This is only for the full field verification option.

Note: Mix Designs will be reviewed according to the tolerances that are located on page 26 of the Procedures Manual for Mix Design Processing.

1. Materials Required

- 1 - 5000 Gram Sample of mixture.
- 1 - 5000 Gram Samples of combined aggregates

Aggregate Wear Index (AWI) samples shall be submitted to the central lab at least one week prior to mix design submittal. This may delay the test strip verification if not submitted in a timely manner.

2. Documentation Required

Note: Computer duplication of forms must follow MDOT formats.

1. Form 1820 - Contractor Bituminous Mix Design Communication.
2. Form 1923 - Submitted Mix Design Summary Sheet.
3. Form 1822 - Marshall Mix Design Worksheet.
4. Form 1806 - Theoretical Maximum Specific Gravity.
5. Form 1813 - Submitted Mix Design Summary Sheet.
6. Form 1849 - Bituminous Mix Design Checklist.
7. Provide documentation of Quality Control Testing of RAP Stockpiles. Note: Only if RAP is used in the mixture.
8. Combined gradation plotted on the 0.45 power gradation chart.
9. Mix Design Regression Analysis.
10. For consultants, a letter from the contractor authorizing that you, the consultant, acts as the contractors agent on mix design issues for the project.